VIABILITY OF A COOPERATIVELY COORDINATED EGG COMPLEX

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PREFACE

In recent years, the egg industry has undergone many changes that have subjected family-size egg producers to severe economic pressures. A structural change of major importance is the development of substantial numbers of large-scale, owner-integrated egg complexes. These complexes have direct control over all phases of the production-marketing process, and are able to take advantage of economies of large-scale operation to reduce their total system costs. For example, a new $8 million, 1.1-million-bird egg complex is planned to be in full production at Bethune, S.C., by late 1975. The complex will include a feed mill, brooding and rearing facilities, 16 laying houses, and an egg processing plant.

Continued growth of these complexes portends a market environment that could endanger the survival of family-size producers in the egg industry of the future. It has been suggested that one way these producers might remain a viable part of the egg industry is to participate in a coordinated production-marketing system operated by their cooperative. It is not clear, however, that even this alternative would allow them to gain enough efficiency to successfully compete with large-scale, owner-integrated egg complexes.

The purpose of this study was to determine if a cooperatively coordinated (decentralized) egg production-marketing system made up of family-size producers could be economically viable. The scope of the study was limited to an analysis of the synthesized cost structures of two simulated coordinated egg complexes—a decentralized contract production complex and a centralized owner-integrated complex. Technical and cost data were obtained from several cooperatives that currently operate coordinated egg production-marketing systems. The technical and cost data used in this report were based on the information supplied by the cooperatives, but are not identical to any individual cooperative's operating figures.

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HIGHLIGHTS

Family-size producers operating a cooperative decentralized egg production system would have difficulty competing in an industry dominated by centralized owner-integrated complexes.

That conclusion comes from analyzing synthesized cost structures for two model systems.

It would cost a decentralized family-producer complex nearly $49,000 a year more than a centralized complex to produce and process shell eggs. This is equivalent to a quarter of a cent a dozen for the 20.7 million dozen eggs that would be marketed each year. The decentralized complex's costs do not include a payment for contract producers' labor. If these producers received a labor return at the assumed wage rate for centralized production labor, decentralized costs would exceed centralized costs by more than $340,000 a year. This would amount to 1.6 cents a dozen eggs marketed.

A cooperative complex possibly could compete with owner-integrators if it could be more efficient than assumed in the model. The cooperative would need to improve production efficiency, such as feed conversion and rate of lay, as well as reduce the unique costs associated with feed distribution, egg assembly, and field service.

Whether or not a more efficient cooperative complex could operate in the same market environment with owner-integrators largely depends on the minimum returns the cooperative and contract producers are willing to accept for their capital and labor. If it is to be viable, the participants in a cooperative complex probably will have to accept somewhat lower returns on their resources than owner-integrators would receive.

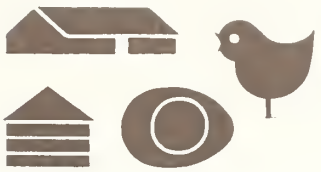
Both model complexes used were assumed to be of the same size and to perform essentially the same functions. Operations would include feed processing, started pullet production, egg production, shell egg processing, and marketing of shell eggs and spent fowl. The complexes would have a housing capacity of 512,000 pullets and 1.2 million laying hens. Each would produce 1.1 million started pullets and 21.1 million dozen eggs annually.

The decentralized model complex would consist of a cooperative-owned feed mill and egg packing plant located in the center of a production area 30 miles in radius. The cooperative would coordinate the production activities of 16 contract pullet producers and 40 contract egg producers scattered evenly over the production area. It also would deliver feed to and assemble eggs from the producers.

The centralized model complex would be completely owned and operated by a single firm. All facilities and activities would be situated on a 180-acre central farm. The complex facilities would include a feed mill, 16 pullet houses, 40 layer houses, and an egg packing plant.

The decentralized complex would require a total investment of nearly $10.9 million. Estimated egg production and processing costs would total $9,753,000 a year, or 47.12 cents a dozen eggs marketed. About 80 percent of the cost of processed eggs would be accounted for in producing them.

The total investment in the centralized complex was estimated to exceed $10.8 million. Total operating costs were estimated at $9,704,000 a year, or 46.88 cents a dozen eggs marketed. Production costs would represent about 84 percent of the total cost of processed eggs.



VIABILITY OF A COOPERATIVELY COORDINATED EGG COMPLEX

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INTRODUCTION

Coordination[1] has played a significant role in the evolution of the egg industry over the past two decades. With the growing importance of coordination, more and more production has moved out of the hands of independent, family-size producers. This trend is likely to continue, with coordination being an important force shaping the future structure of the egg industry.

Coordination is not as widespread in eggs as in broilers, but coordinated operations have come to be an important source of the Nation's market egg supplies. In 1955, they supplied only about 1.8 percent of the market eggs. By 1969, this proportion had grown to about 38.2 percent. In the South Atlantic, South Central, and Western regions, coordinated operations accounted for an estimated 43.3, 65.8, and 52.7 percent, respectively, of 1969 market egg supplies.[2] Coordinated operations no doubt account for an even larger proportion of egg production today.

One of the major effects of coordination has been on interregional shifts in egg production. Rogers has suggested that "those regions which developed further and faster toward a high degree of integration or coordination would be likely to enjoy a competitive advantage, other things being equal."[2] This also would suggest that coordinated egg operations enjoy a competitive advantage over independent family-size egg producers.

Basically, two types of coordinated operations have developed in the egg industry—contract production and owner-integrated. In 1969, each type of operation supplied about 19 percent of the Nation's market eggs.[2] However, based on an analysis of 1966 data it appeared that owner-integrated operations might be growing at a faster rate than contract production. It also appeared that these operations might be replacing contract production in some areas.[3]

In recent years, several cooperatives have initiated contract egg programs that, to varying degrees, coordinate the provision of production inputs, started pullet and egg production, processing, and marketing. Several of these operations are organized on a "complex" basis, with a specialized poultry feed mill and an egg processing plant forming the nucleus of a restricted production area. These contract production complexes most closely approach the organization and efficiency of owner-integrated egg complexes.

Cooperatives' coordinated systems have helped family-size producers survive the price instability and severe competition of the egg industry. But these systems must be economically viable if they are to be successful in helping retain future egg production in the hands of family-size producers. The question of their longrun viability has not been answered, however, especially if they must compete in an industry dominated by owner-integrated egg complexes. If they cannot be viable little longrun justification can be made for cooperatives and their producer-members to invest their limited resources in contract production operations.

Study Approach

Two model egg complexes were simulated to provide a basis for analysis. One was a decentralized contract

[1] *Coordination, as used here, refers to the exercise of control over two or more steps of the production-marketing process by one management, either through ownership or through contractual arrangements.*

[2] *Rogers, G. B. 1971. Vertical and Horizontal Integration in the Market Egg Industry, 1955-69. U.S. Dept. Agr., Econ. Res. Serv. ERS-477, May.*

[3] *Rogers, G. B., Conlogue, R. M., and Irvin, R. J. 1970. Economic Characteristics of and Changes in the Market Egg Industry. U.S. Dept. Agr., Mktg. Res. Rpt. 877, April.*

production complex (decentralized complex) similar to those operated by some cooperatives. The other was a centralized owner-integrated complex (centralized complex). These model complexes are described on pages 6, 12.

The cost structures of both model complexes were synthesized, based on cost data obtained from several operating cooperatives. With two exceptions, all costs of producing and processing shell eggs were included in the estimates regardless of who would incur them. No costs were included to compensate contract pullet growers and contract egg producers for their labor contribution in the decentralized complex. The difference in total costs between the two model complexes was assumed to be a residual return to these contract producers in payment for their labor, whether this difference was positive or negative.

In addition to out-of-pocket expenses (wages and salaries, chicks, feed, utilities, repairs, fuel, and so forth), the cost estimates include depreciation on all facilities and equipment and an interest charge on all capital invested in land, buildings, equipment, and inventories. The interest charge was calculated at a rate of 8 percent a year and represents a return on average investment rather than an interest expense on borrowed funds. Marketing costs were not included because it was assumed both complexes would carry on identical marketing operations and incur the same costs.

STUDY FINDINGS

The comparative cost analysis indicated that the decentralized model egg complex could not produce and process shell eggs as cheaply as the centralized complex. Total annual costs would be nearly $49,000 greater for the decentralized complex (table 1). This is equivalent to almost a quarter of a cent a dozen for the 20.7 million dozen eggs that would be marketed each year. However, this comparison does not accurately reflect the competitive position of the decentralized complex because the cost estimates do not include a charge for contract producers' labor.

What do these findings mean in terms of returns on contract producers' labor and on capital invested in the decentralized complex? Suppose the wholesale price of eggs was such that both complexes would receive a net price of 46.884 cents a dozen after all marketing costs had been paid. This would be just sufficient to cover total costs of the centralized complex. The owner-integrator would thereby realize an 8 percent return on his average investment. But, the decentralized complex would be $49,000 short of covering its total annual costs, excluding any payment for contract producers' labor. In other words, contract producers would receive nothing for their labor and a return of only 7.3 percent would be realized on average investment in the decentralized complex.

The decentralized complex would have to sell its eggs for 1.64 cents a dozen more than the break-even price for the owner-integrator to realize labor and capital returns comparable with those of the centralized com-

Table 1—Estimated egg production and processing costs for decentralized and centralized model egg complexes

Function	Decentralized complex		Centralized complex	
	Total annual cost[1]	Cost per dozen[1,2]	Total annual cost[1]	Cost per dozen[1,2]
	Dollars	*Cents*	*Dollars*	*Cents*
Egg production	[3]7,929,772	38.314	8,146,748	39.362
Field service	55,190	.267	0	0
Egg assembly	80,982	.391	0	0
Egg processing	1,517,690	7.333	1,371,561	6.627
Administrative overhead	168,955	.816	185,333	.895
Total	[3]9,752,589	47.121	9,703,642	46.884

[1] Includes an interest charge of 8 percent a year on average investment.
[2] Based on 20,697,034 dozen marketed.
[3] Does not include a charge for contract pullet growers' and contract egg producers' labor.

plex. This price would be needed to provide an 8-percent return on average invested capital and $2.98 an hour for contract producers' labor.[4]

Unique Costs

Several areas in the cost structure of the decentralized complex involve unique functions that centralized complexes either do not have to perform or can perform at substantially lower costs. These costs are important factors affecting a cooperative's ability to compete with owner-integrated egg complexes.

Two decentralized complex functions that involve unique costs are field service and egg assembly. Together the performance of these functions would cost a cooperative an estimated $136,000 a year (table 1), a cost that would not be incurred by an owner-integrator. A third function is feed distribution. The cost of distributing feed to production units would be $33,000 greater for the decentralized complex than for the centralized. In total, these unique functions would add more than $169,000 to annual costs of the decentralized complex.

These unique costs cannot be eliminated in a decentralized complex, but they might be reduced. For example, a smaller service area would result in lower costs for performing all three functions involved. Encouraging larger production units also would reduce egg assembly and field service costs. The cost of providing field service is little greater, if any, for a 60,000-bird producer than for one handling only 30,000 birds.

It should be pointed out, however, that reductions in these unique costs would not have a great impact on decentralized complex returns. Even if the total unique costs of $169,000 were eliminated, the complex would realize returns of only 8 percent on investment and $1.23 an hour on contract producers' labor. This assumes a wholesale egg price that is break-even for the centralized complex.

Factors Affecting Cooperative Viability

These findings do not necessarily mean that a decentralized complex cannot compete with centralized complexes. The ability of family-size egg producers to compete through a cooperatively coordinated system depends on several variable factors, among which are the following:

1. The wholesale price of eggs.
2. The minimum acceptable return on invested capital and contract producers' labor in a decentralized complex.
3. Owner-integrators' minimum acceptable return on invested capital in a centralized complex.
4. The relative physical production efficiency in the two types of complexes.

Because of the high degree of uncertainty with regard to the expected values of these factors, no attempt will be made here to draw definitive conclusions about the economic viability of a decentralized complex. Rather, the implications of alternative values for these factors will be discussed to aid producers and their cooperatives in making a determination of their ability to compete.

Wholesale Egg Prices

The absolute level of future wholesale egg prices cannot be predicted. But, over the long run, the level of prices must be sufficient to cover the total costs of the most efficient production-processing system and provide the participants with a reasonable profit. It has already been shown that if this level is the break-even price for the owner-integrator, a decentralized complex probably could not compete, given the assumptions of the study models.[5]

Table 2 shows estimated returns when wholesale prices are 1 to 4 cents a dozen above centralized complex costs (which include an 8-percent return on investment), assuming both complexes receive the same wholesale price. It appears that the very minimum wholesale price level that would permit a decentralized complex to be viable would be 2 cents a dozen above centralized costs. But, even at this level, 8 percent would not be an attractive return on investment if the complex had to be financed with borrowed funds at present interest rates.

At prices above this level, contract producers' labor returns would rise by about $2.12 an hour for every 1-cent increase in price if return on investment was held constant at 8 percent. On the other hand, if labor returns were held constant, return on investment would rise. For example, if the labor return was fixed at $5.00 an hour, the return on investment in the decentralized complex would be 9.2 percent with prices at 3 cents a dozen above centralized costs and 12.3 percent at a margin of 4 cents a dozen.

Decentralized Opportunity Costs

Only producers and their cooperatives can determine the level of return necessary to attract their investment in a coordinated egg system. The minimum return they could afford to accept depends upon the opportunity costs of their capital and labor, or the maximum returns these resources would generate in some alternative use.

[4] *The assumed wage rate, including fringe benefits, for production labor in the centralized complex was $2.98 an hour.*

[5] *This also assumes that an 8-percent return on investment would be a reasonable profit for owner-integrators.*

Table 2—Investment and labor returns at various wholesale egg price levels above centralized complex costs

Wholesale price per dozen above centralized complex costs[1]	Centralized complex return on investment	Decentralized complex return on	
		Investment	Contract producers' labor
Dollars	*Percent*		*Dollars/hour*
0.00	8.0	7.2	0
.01	11.1	8.0	1.61
.02	14.1	8.0	3.73
.03	17.2	8.0	5.85
.04	20.3	8.0	7.96

[1] Represents returns above all costs, including an 8-percent annual interest charge on invested capital.

These opportunity costs will vary, depending on what alternative opportunities are available to producers and their cooperatives for the use of these resources.

Table 3 shows wholesale egg price margins above centralized system costs required to produce various levels of return on decentralized complex investment and contract producers' labor. As contract producers' labor return is increased by $1.00 an hour, total decentralized complex costs would rise by about half a cent a dozen, given a constant return on investment. On the other hand, each 5-percent increase in return on investment would result in higher total costs of about 1.6 cents a dozen, assuming a constant labor return.

This information should help cooperatives and producers determine if they could compete at the level of returns necessary to attract their investment in a decentralized complex. Suppose, for example, that the minimum acceptable returns in a cooperative complex were 15 percent on investment and $5.00 an hour for contract producers' labor. Decentralized system costs would then exceed centralized system costs by 4.9 cents a dozen. In other words, these minimum returns could be realized only if wholesale egg prices exceeded centralized costs by 4.9 cents a dozen. At higher levels of expected returns even larger wholesale price margins would be necessary to assure the economic viability of a decentralized complex.

Centralized Opportunity Costs

Up to this point, the comparative cost analysis has assumed an 8-percent interest charge on the average capital invested in a centralized complex. But, it is highly unlikely that an owner-integrator would be willing to invest in a centralized complex with the expectation of receiving such a low return on his capital. Like producers and their cooperatives, owner-integrators have alternative investment opportunities. The maximum potential return from these alternatives must be considered by the owner-integrator as an opportunity cost of investing capital in a centralized egg complex.

As owner-integrators' opportunity cost of capital is increased, total costs for the centralized complex rise

Table 3—Wholesale egg price margins above centralized costs required to produce various levels of return on decentralized complex investment and contract producers' labor

Contract producers' labor return per hour	Egg price margin above centralized costs[1] required to produce decentralized complex return on investment of—			
	5 percent	10 percent	15 percent	20 percent
Dollars	*Cents per dozen*			
2.00	0.2	1.8	3.5	5.1
3.00	0.7	2.3	3.9	5.6
4.00	1.1	2.8	4.4	6.0
5.00	1.6	3.3	4.9	6.5
6.00	2.1	3.7	5.4	7.0
7.00	2.6	4.2	5.8	7.5

[1] Centralized costs include an 8-percent return on investment and a wage rate of $2.98 an hour for hired production labor.

due to higher interest charges on average invested capital. This results in a more favorable position for a decentralized complex, assuming an egg price level that is break-even or higher for the centralized complex. The ability of a decentralized egg complex to compete largely depends on the minimum returns required by owner-integrators and by the cooperative coordinator and contract producers.

Table 4 shows the labor and investment returns a decentralized complex would receive at various levels of return on investment in the centralized complex. Assume that owner-integrators required a return of 25 percent on their investment in a centralized complex. If contract producers required $7.00 an hour for their labor, the decentralized complex could compete, providing 14.1 percent was an acceptable return on investment. On the other hand, if 16 percent return on investment was required, the decentralized complex could compete only if contract producers would accept $5.71 an hour for their labor.

The possibility exists that owner-integrators' opportunity costs are so high that they may not be willing to compete with decentralized complexes over the long run. Suppose, for example, that they required a 25 or 30 percent return on investment in a centralized complex. Assume also that returns of $5.00 an hour for contract producers' labor and 12 percent on investment would be acceptable in a cooperative complex. The cooperative could then sell its eggs at a break-even wholesale price that would permit a return of only 20 percent on investment in the centralized complex (table 4). If the participants were willing to accept these returns, decentralized complexes could become the dominant competitive force in the egg industry.

Relative Production Efficiency

The original cost estimates were based on the assumption of equal physical production efficiency in both model complexes. But if contract producers could produce more efficiently than the assumed level, a decentralized complex would be in a better position to compete with owner-integrated complexes. Higher feed conversion rates in pullet growing and egg production, lower pullet and layer mortality, and a higher rate of lay all would result in reduced costs and higher returns for the decentralized complex.

How much must the decentralized complex improve efficiency to achieve returns comparable with the centralized complex; that is, 8 percent a year on average investment and $2.98 an hour for contract producers' labor? Consider, for example, feed conversion and rate of lay. A feed conversion rate of about 3.85 pounds of feed per dozen eggs produced *or* a rate of lay of about 249 eggs per bird housed would be required to make decentralized returns comparable with those in an owner-integrated system.

Can a Cooperative Compete?

This study indicates that it would cost more to produce and process shell eggs in a decentralized complex than in a centralized complex. Operation of such a complex by a cooperative would not enable family-size egg producers to compete in an industry dominated by owner-integrated complexes.

If, however, a cooperative could improve upon the model efficiency assumptions it possibly could be competitive. To do this, the cooperative would need to help contract producers surpass owner-integrators' level of physical efficiency in such factors as rate of lay and feed conversion. Also, it would need to reduce as much as possible the unique costs associated with feed distribution, egg assembly, and field service.

In addition, if a cooperative complex is to be viable, the participants—the cooperative and contract producers—probably will have to settle for somewhat lower returns on their resources than owner-integrators would receive. In the final analysis, whether or not a more efficient decentralized system could operate in the same market environment with owner-integrators largely depends on the minimum returns the participants are willing to accept for their labor and capital.

Table 4—Decentralized complex returns on investment and contract producers' labor at various levels of return on investment in the centralized complex

Percent return on centralized complex investment	Decentralized complex					
	Return on investment when producers receive—			Return on producers' labor when return on investment is—		
	$3/hour:	$5/hour:	$7/hour:	8 percent:	12 percent:	16 percent
	Percent			*Dollars per hour*		
15	9.9	7.0	4.1	4.33	1.57	-1.18
20	14.9	12.0	9.1	7.78	5.02	2.26
25	19.9	17.0	14.1	11.23	8.47	5.71
30	24.9	22.0	19.1	14.67	11.92	9.16
35	29.9	27.0	24.1	18.12	15.36	12.61

ANALYSIS OF MODEL EGG COMPLEXES

The two model egg complexes simulated in this study were assumed to carry on similar operations and to have the same production capacities and outputs. The coordinating firms would control the systems through ownership, contractual arrangements, or a combination of the two.

The production-marketing functions that would be coordinated in both complexes are as follows:

1. Purchase of day-old chicks.
2. Purchase of feed ingredients and manufacture and distribution of feed to production units.
3. Provision of miscellaneous production supplies and services, such as medication, egg oil, debeaking, and vaccination.
4. Production of started pullets.
5. Production of eggs.
6. Provision of management assistance to contract producers (decentralized complex only).
7. Egg assembly.
8. Processing shell eggs.
9. Marketing shell eggs.
10. Marketing spent fowl.

Both complexes would have a housing capacity of 512,000 pullets and 1,200,000 laying hens. Each complex would produce 1,087,696 started pullets and 21,119,422 dozen eggs annually. It would market 20,697,034 dozen eggs and 922,663 spent hens a year.

Decentralized Complex

The decentralized model complex was organized around a feed mill and an egg packing plant that formed the nucleus of a production area 30 road miles in radius. It was assumed that a cooperative owned and operated these facilities and coordinated the production activities of 16 contract pullet growers and 40 contract egg producers. These 56 farmers were assumed to be scattered evenly over the production area; their average distance from the central facilities was 18 road miles.

Feed Processing

The cooperative would purchase feed ingredients and process all feed used in the decentralized complex. Feed would be processed in a specialized poultry feed mill that would produce only five different rations—three pullet and two layer. All finished feed would be in the form of mash and would be stored and distributed in bulk.

The feed mill was assumed to have the capacity of producing 14 tons of feed per hour. It would be operated two 8-hour shifts a day, 5 days a week. A total of 201 tons of feed would be produced each day. On the average, this would be composed of 33 tons of pullet feed and 168 tons of layer feed. The feed mill would have the capacity to store 6 days' requirements of major feed ingredients and 1 day's production of finished feed.

Investment.—The total investment in feed processing was estimated at $589,719. The feed mill would represent an investment estimated at $493,000, based on early 1974 costs.[6] The remaining $96,719 would be invested in feed ingredient inventories.

Facilities would account for 54 percent of the feed mill investment and equipment 42 percent. Facilities included in the cost estimate were: mill building, outside ingredient and finished feed storage, office, and rail siding. Equipment cost included installation. Investments are:

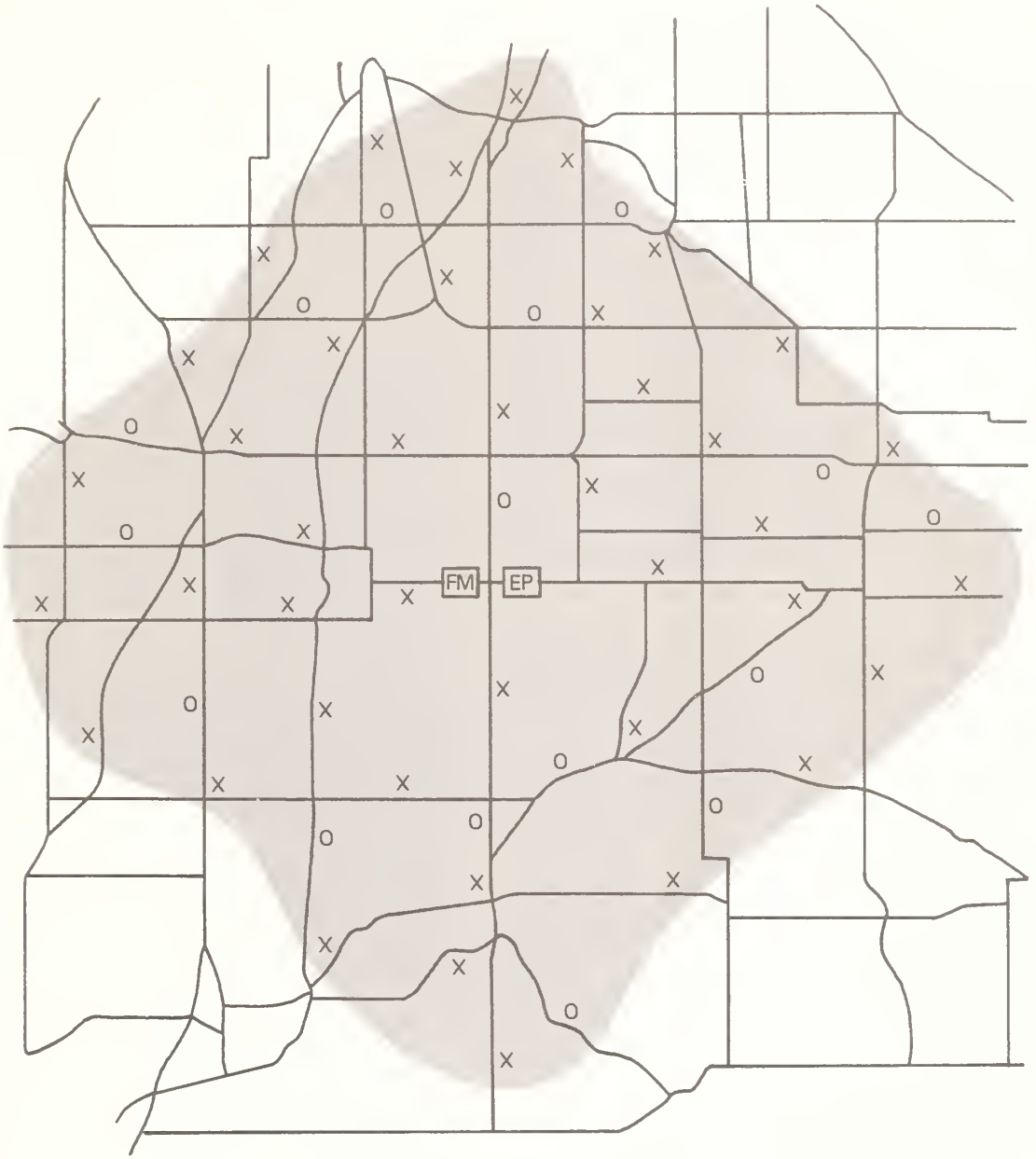
Item	*Investment*
Feed mill facilities	$264,000
Feed mill equipment	209,000
Land and improvements	20,000
Feed ingredients inventory	96,719
Total	589,719

Operating Costs.—The cooperative would incur feed processing costs of nearly $228,000 a year, or $4.36 for each ton of feed produced. This does not include the cost of ingredients.

More than 70 percent of the costs would vary with the tonnage of feed produced. Payroll would head the list of variable costs representing nearly one-third of

[6] *Facilities and equipment cost estimates were provided by Carl J. Vosloh, Jr., Economic Research Service, U.S. Department of Agriculture, from unpublished data.*

A TYPICAL DECENTRALIZED EGG COMPLEX



FM - Feed Mill
EP - Egg Processing Plant
X - Contract Egg Producer
O - Contract Pullet Grower

0 5 10 15 20
Scale (miles)

total costs. Detailed cost estimates are presented in appendix table 1. Operating costs are:

Type of cost	*Cost per year*	*Cost per ton*
Fixed	$ 66,529	$1.27
Variable	161,105	3.08
Total	227,634	4.36

Feed Distribution

Feed distribution is one of the critical cost functions for the decentralized complex. The cost of performing this function is greater for the decentralized complex than for the centralized complex because of the greater distances feed must be hauled.

A total of 201 tons of feed would be distributed each weekday. Feed would be hauled in two tractor-trailer bulk feed trucks with a capacity of 24 tons each. Both trucks would deliver five 20-ton loads each day. It was estimated that each delivery would require an average round-trip time of 84 minutes and would cover an average distance of 36 miles.

Investment.—The investment required for the feed distribution function is limited to the cost of the feed trucks. This cost was estimated at $38,000 a truck, or a total of $76,000.

A spare feed truck was not included in the model because of the high investment and fixed operating costs. Also, tractor-trailer trucks were selected because they provide more flexibility than straight trucks in case of serious engine or chassis breakdowns. A tractor usually could be rented easily to fill in during down time, but it probably would be difficult to rent a straight truck with a bulk feed body.

Operating Costs.—Feed distribution would cost the cooperative complex nearly $62,000 a year, or $1.18 a ton. More than one-third (36 percent) of these costs would be fixed, with truck depreciation accounting for 70 percent of total fixed costs. Detailed cost estimates are presented in appendix table 2. Operating costs are:

Type of cost	*Cost per year*	*Cost per ton*
Fixed	$21,940	$0.42
Variable	39,762	.76
Total	61,702	1.18

Pullet Growing

Started pullets would be grown by 16 farmer-members under contract with the coordinating cooperative. Each contract producer was assumed to have one 32,000-bird capacity pullet house and would produce 30,080 started pullets from each flock, enough to fill a layer house. This production is based on an assumed mortality and cockerel loss of 6 percent of house capacity, or 8 percent of chicks caged, assuming a 2-percent overage of chicks placed in the house.

Care of a 32,000-bird flock is only a part-time job, requiring about 3 hours of the producer's labor each day. A full-time pullet grower could handle 90,000-120,000 birds, especially with some family labor. But the 32,000-bird operation is well suited to diversified family farming operations and to part-time farming. Decentralized complex costs probably could be reduced, however, if pullets were produced by larger and fewer growers.

It was assumed the birds would be kept in the pullet growing houses until they reached 20 weeks of age. They would then be moved to laying houses of contract egg producers. The pullet houses would remain empty for 3 weeks between flocks to facilitate cleaning and sanitation. This schedule would permit each contract grower to produce 2.26 flocks a year, or a total of 67,981 pullets. Thus, the 16 producers would produce a total of 1,087,696 started pullets annually.

The model assumed that pullets would be phase fed—three different rations at different phases of growth—and would consume a total of 15.5 pounds of feed per pullet produced. Feed would be delivered to pullet growers in 20-ton loads, so their average feed inventory was assumed to be 10 tons.

Investment.—The major investment in pullet growing would be for housing. The model houses were assumed to be controlled-environment, cage houses with automatic feeding and watering equipment and storage tanks for 22 tons of feed. In early 1974, a 32,000-bird house represented an investment estimated at $69,900, including the cost of building, equipment, and land and improvements. Building and equipment represented 48 and 46 percent, respectively, of this cost.

Total complex investment in pullet growing was estimated at $1,322,566, as shown in the following tabulation:

Item	*Investment*
Pullet housing	$1,118,400
Chicks	184,320
Feed inventory	19,846
Total	1,322,566

Housing represented 85 percent of the total pullet growing investment and most of the remaining investment would be in chicks.

Operating Costs.—Estimated pullet growing costs would total $1,748,337 a year, or nearly $1.61 for each

pullet produced. Nearly 91 percent of these costs would be variable.

Feed and chicks together would account for 92 percent of variable costs and 84 percent of total costs. Detailed cost estimates are presented in appendix table 3. Operating costs are:

Type of cost	*Cost per year*	*Cost per pullet*
Fixed	$ 159,565	$0.1467
Variable	1,588,772	1.4608
Total	1,748,337	1.6074

Egg Production

Forty farmer-members would produce eggs for the decentralized system under contract with the coordinating cooperative. It was assumed that each contract producer would have one 30,000-bird laying house and that care of the laying flock would require 5.5 hours of the producer's time each day.

The contract producers would start the production cycle with 20-week-old pullets and would keep them in the laying house for 56 weeks. The production cycle would be completed with a 3-week vacancy period to permit cleaning and sanitizing the laying house between flocks.

Total egg production was based on an assumed rate of lay during the production period of 240 eggs per bird housed. This is equivalent to 0.6090677 egg per day per hen housed. With an average of 1,140,000 hens housed each year, annual production for the complex would total 21,119,422 dozen eggs.

It was assumed layers would be phase fed, with two rations fed at different stages in the production period. Feed would be converted into eggs at an assumed ratio of 4.116 pounds of feed per dozen eggs. This would result in total production period consumption of 82.32 pounds per hen housed, or 21 pounds a day for each 100 hens housed. Producers would receive feed in 20-ton loads and would have an average inventory of 10 tons.

Laying hen mortality was assumed to average 1 percent a month of birds housed. At this rate of mortality, the complex would sell an average of 922,663 spent hens annually. Complex income from spent hen sales was based on an assumed selling weight of 3.6 pounds per bird and a price of 7 cents a pound.

Investment.—Decentralized egg production would require an estimated total investment of $7.2 million. About a fourth of the total, or $2 million, would be invested by the coordinating cooperative in started pullets and feed inventory on contract producers' farms. Investments are:

Item	*Investment*
Layer housing	$5,224,000
Started pullets	1,928,880
Feed inventory	50,476
Total	7,203,356

Nearly three-quarters of the total would be invested in layer housing by contract producers. The layer houses in the model were assumed to be environment-controlled, cage houses with automatic feeding and watering equipment, belt egg collection, hand-operated vacuum packing, and storage for 22 tons of feed. At early 1974 price levels, a 30,000-bird house represented an investment estimated at $130,600, including the cost of building, equipment, and land and improvements. About 56 percent was building cost and 41 percent equipment cost.

Operating Costs.—Production of 21.1 million dozen eggs annually in the decentralized complex would cost an estimated total of $8.16 million, or 38.648 cents a dozen. After deducting income from spent fowl sales, net costs would total an estimated $7.9 million, or more than 37.5 cents a dozen eggs produced. Operating costs are:

Type of cost	*Cost per year*	*Cost per dozen*
Fixed	$ 826,403	$0.03913
Variable	7,335,880	.34735
Total	8,162,283	.38648
Less: Spent fowl income	−232,511	−.01101
Total, net	7,929,772	.37547

Variable costs—feed, pullets, maintenance and repairs, utilities, etc.—are the major components of egg production costs, representing 89 percent of the total. Feed represents the largest single cost item, making up 67 percent of total costs. Started pullets are the second most important item, accounting for 21 percent. Together, feed and pullets represent 88 percent of total costs. Detailed cost estimates are presented in appendix table 4.

Field Service

A decentralized egg production system requires a field service program to provide management assistance to contract pullet growers and egg producers and to ensure uniform application of recommended production practices. The model system assumes that a field serviceman would visit each contract producer (pullet

and egg) at least once a week. In addition, special visits would be made to assist producers with production problems of an emergency nature.

Based on the frequency of visits and the size of the complex production area, it was assumed each fieldman could service a maximum of 20 contract producers. With a total of 56 contract producers to be serviced, the decentralized complex would require three servicemen. It was assumed that one of these would supervise the overall field service program.

Investment.—Only a minimum investment would be required for field service. The total investment would amount to $10,500 for three automobiles.

Operating Costs.—Providing field service to contract producers would cost the decentralized complex an estimated $55,190 a year, or about a quarter of a cent for each dozen eggs produced. This cost is unique to the decentralized complex; it would not be incurred by an owner-integrator.

Most of the field service costs are variable. In fact, payroll costs account for nearly 82 percent of total field service costs. Detailed costs are presented in appendix table 5. Operating costs are:

Type of cost	*Cost per year*	*Cost per dozen*
Fixed	$ 4,415	$0.00021
Variable	50,775	.00240
Total	55,190	.00261

Egg Assembly

Egg assembly is another function unique to the decentralized complex. An estimated total of 13,501 cases of eggs would be assembled weekly from the 40 contract producers' farms.

The coordinating cooperative would pick up eggs from contract producers' farms twice a week. The eggs would be kept under refrigeration while they were in transit to the complex egg packing plant.

It was assumed that the decentralized complex would use the "racks" system of handling eggs. A rack is a shelved storage unit mounted on large-wheeled casters. The producer places his eggs in filler flats and puts the flats of eggs on the shelves of a rack in his egg cooler. The eggs are transported to the packing plant on the racks, and empty racks are left at the farm at pickup time. No cases are used in this assembly system.

Investment.—An investment of an estimated $145,150 would be required to perform the egg assembly function as the following tabulation shows:

Item	*Investment*
Trucks	$ 80,400
Egg racks	64,750
Total	145,150

Fifty-five percent of the total would be invested in two 45-foot refrigerated tractor-trailer trucks. With the eggs on racks, each truck would have a capacity of 739 cases on 45 racks.

The remaining 45 percent represents an investment in 925 egg racks. Most racks would hold 16.5 cases, but a few short ones that would fit under the truck refrigeration unit would hold only 13 cases.

Operating Costs.—The decentralized system would have costs of nearly $81,000 a year, or 0.383 cent a dozen produced, for assembling eggs from contract producers' farms. More than half of total costs are fixed costs. Nearly 80 percent of fixed costs are represented by depreciation on trucks and egg racks. Operating costs are:

Type of cost	*Cost per year*	*Cost per dozen*
Fixed	$47,269	$0.00224
Variable	33,713	.00160
Total	80,982	.00383

The major variable costs are wages and employee benefits. Together these account for three-fifths of variable costs. Detailed cost estimates are presented in appendix table 6.

Egg Processing

The cooperative would own and operate an egg packing plant to wash, candle, grade, and package all eggs produced in the decentralized system. The model egg packing plant was assumed to have a weekly volume of 13,501 cases of eggs. The plant would have 4 processing machines, each with a capacity to process 70 cases of eggs an hour. The maximum effective output of each machine was assumed to be 65 cases an hour.

The plant would operate two 8-hour shifts a day, 5 days a week. Four machines would be operated during the first shift and two machines the second shift. The plant would process 21,119,422 dozen eggs a year. With an assumed 2-percent egg loss during processing, only 20,697,034 dozen would be marketed annually.

It was assumed that 70 percent of the eggs would be cartoned and 30 percent sold loose in cases. An average of 2 days' processing volume would be held in inventory at all times. Two-thirds of the inventory would be

processed eggs and one-third unprocessed. Average inventories of packaging materials and plant supplies would represent 5 weeks' and 9 weeks' requirements, respectively.

Investment.—Egg processing would require a total investment estimated at more than $1.5 million. Nearly $1.4 million, or 89 percent of the total, would be invested in fixed plant facilities. Investments are:

Item	*Investment*
Buildings	$ 643,214
Equipment	564,555
Land and Improvements	165,000
Egg and supplies inventories	165,423
Total	1,538,192

The cost estimates were based on a plant with a processing room capable of accommodating four egg packing machines. In addition, the processing building also included cooler space for 10,600 cases of eggs, dry storage for packaging and plant supplies, office space, and employee facilities. A single-bay vehicle maintenance garage was also included in buildings cost.

The major equipment cost was for the egg processing machines. The cost estimate for the packing machines included vacuum loaders, egg washers, and plastic flat washers.

More detailed estimates of the processing plant cost are presented in appendix table 7.

Operating Costs.—The decentralized complex would incur costs estimated to exceed $1.5 million a year to process its shell eggs. This would amount to 7.186 cents a dozen for the 21,119,422 dozen eggs processed. Operating costs are:

Type of cost	*Cost per year*	*Cost per dozen*
Fixed	$ 199,556	$0.00945
Variable	1,318,134	.06241
Total	1,517,690	.07186

The largest share of these costs (87 percent) would be variable. More than half of total costs would be accounted for by packaging materials expense. Another quarter would go for payroll expenses. Together these two cost items would account for 91 percent of variable costs and 79 percent of total costs. Detailed egg processing cost estimates are presented in appendix tables 8 and 9.

Administration

An estimated total of $168,955 would be required to cover the administrative overhead costs of operating the decentralized complex. This cost was computed on the basis of 0.8 cent a dozen eggs produced. The administrative overhead would cover the costs of a complex manager, a production manager, secretarial and clerical support, office expenses, and other expenses that are not directly allocable to specific complex functions.

Total Complex Costs

A total investment estimated at nearly $10.9 million would be required to set up and operate a decentralized egg complex (table 5). This investment does not include working capital other than that needed to finance inventories.

Two complex functions—pullet growing and egg production—would represent 78 percent of total invest-

Table 5—Estimated total investment required of participants in a decentralized egg complex

Complex function	Coordinating cooperative investment	Contract producers' investment	Total investment
		Dollars	
Feed processing	589,719		589,719
Feed distribution	76,000		76,000
Pullet growing	204,166	1,118,400	1,322,566
Egg production	1,979,356	5,224,000	7,203,356
Field service	10,500		10,500
Egg assembly	145,150		145,150
Egg processing	1,538,192		1,538,192
Total	4,543,083	6,342,400	10,885,483

Table 6—Interest charged to complex functions to provide decentralized participants a return on investment of 8 percent a year

Complex function	Coordinating cooperative	Contract producers	Total
		Dollars	
Feed processing	28,257		28,257
Feed distribution	3,040		3,040
Pullet growing	14,161	47,360	61,521
Egg production	150,294	215,520	365,814
Field service	420		420
Egg assembly	5,806		5,806
Egg processing	74,745		74,745
Total	276,723	262,880	539,603

ment. While contract producers would have direct investments only in these two functions, they would be responsible for 58 percent of total complex investment. In addition, as members they could be responsible for part or all of the $4.5 million investment the coordinating cooperative would be required to make.

The decentralized complex would have total operating costs estimated at $9,752,589 a year. This is equivalent to 46.178 cents a dozen eggs produced or 47.121 cents a dozen eggs marketed, assuming a 2-percent processing loss. About 80 percent of the cost of processed eggs would be accounted for in producing them. These costs are summarized in appendix table 10.

Operating costs are heavily weighted toward variable costs; they account for 87 percent of the total. The complex would have to cover these costs, even in the short run. In the long run, the other 13 percent, or the fixed costs, must also be covered.

Interest charges on capital invested would account for almost half (43 percent) of fixed costs. Based on the total investment, the decentralized complex would have to cover an estimated annual interest charge of $539,603 to provide the participants with an 8-percent return on their invested capital (table 6). The interest charge would be about equally split between the cooperative and contract producers. This is not in the same proportion as the participants' investments. However, contract producers' investment is largely in depreciable assets, while the cooperative would have a higher proportion of its investment in nondepreciable assets such as inventories.

The decentralized cost estimates do not include a charge for contract producers' labor. These producers would spend an estimated 97,820 hours a year producing started pullets and eggs. If they were to receive $2.98 an hour for their labor, the decentralized complex would have an additional cost of $291,504, or 1.41 cents a dozen eggs marketed. Total costs would then be $10,044,093, or 48.529 cents a dozen eggs marketed.

Centralized Complex

The centralized model egg complex was assumed to be completely owned by a single integrating firm. All complex functions would be carried on by the owner-integrator with hired labor.

Feed processing, started pullet production, and egg processing facilities all were assumed to be located on a single 180-acre central farm. The complex would employ the in-line production-packing concept where there would be a constant flow of eggs from the hen through processing to the consumer package.

The physical layout of the model complex is shown in the accompanying figure.

Feed Processing

The assumptions underlying the analysis of the centralized feed processing function are the same as those for the decentralized complex. They are summarized as follows:

Feed mill capacity - 14 tons an hour
Feed mill operating schedule - two 8-hour shifts a day, 5 days a week
Daily feed output - 201 tons
Average composition of output - 33 tons of pullet rations, 168 tons of layer rations
Form of feed and packaging - All mash, all bulk
Major ingredients storage - 6 days' requirements
Finished feed storage - 1 day's production

Investment.—An owner-integrator would need to make an investment of nearly $600,000 to provide for

feed processing. This is slightly higher than the decentralized complex investment, due to the higher cost of land and improvements allocated to centralized feed processing. Investments are:

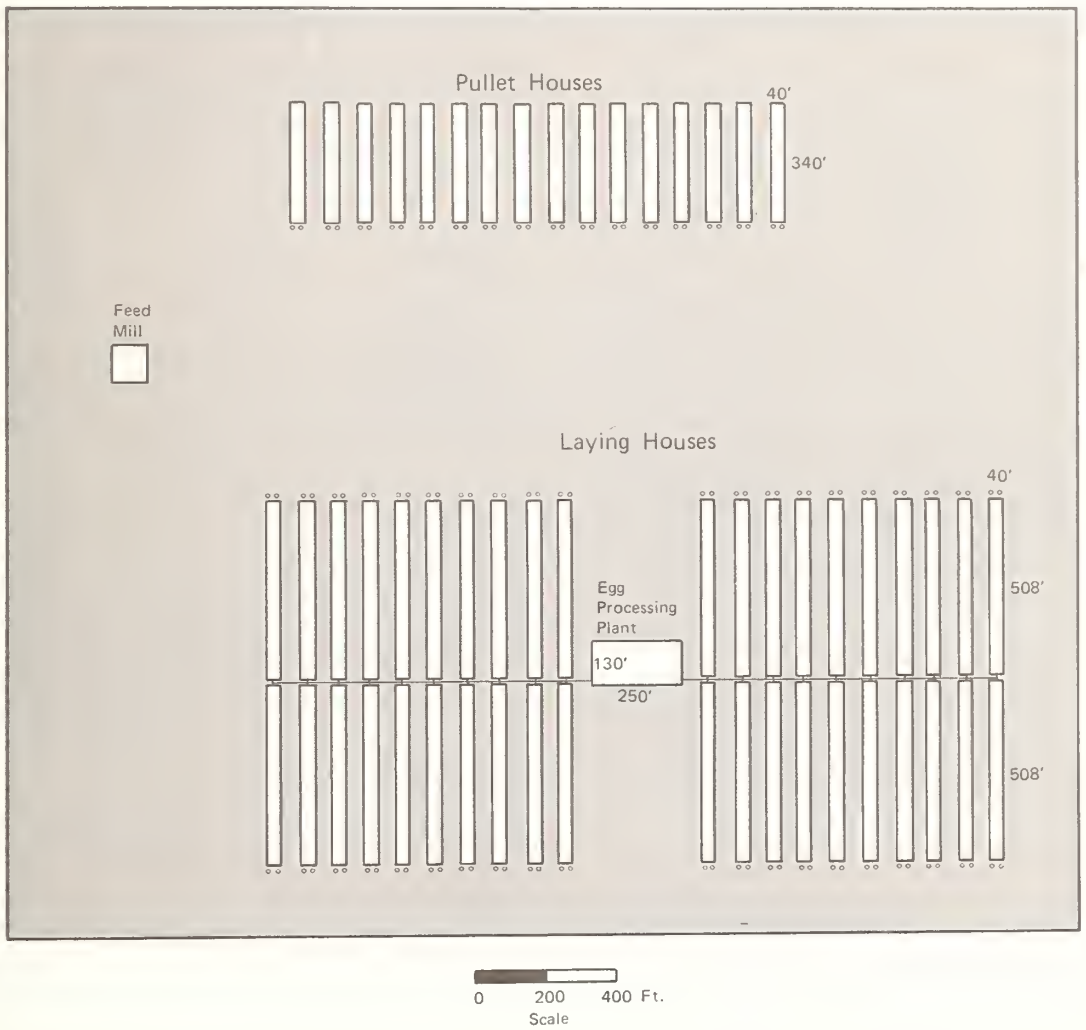
Item	*Investment*
Feed mill facilities	$264,000
Feed mill equipment	209,000
Land and improvements	29,264
Feed ingredients inventory	96,721
Total	598,985

Feed mill facilities and equipment would account for $473,000, or nearly 80 percent of the total investment. The cost estimate for facilities included the mill building, outside ingredient and finished feed storage, office, and rail siding. Equipment cost included installation.

Operating Costs.—Processing feed would cost the centralized complex an estimated $223,976 a year, or $4.29 a ton. Nearly three-fourths of operating costs would be variable, with the major variable cost being for employees. Depreciation and interest on investment together account for nearly 90 percent of fixed costs. Detailed cost estimates are presented in appendix table 11. Operating costs are:

Type of cost	*Cost per year*	*Cost per ton*
Fixed	$ 62,871	$1.20
Variable	161,105	3.08
Total	223,976	4.29

PHYSICAL LAYOUT OF CENTRALIZED MODEL EGG COMPLEX



Feed Distribution

The centralized complex would distribute 201 tons of feed from the feed mill to pullet and layer houses by truck each day. A single 24-ton tractor-trailer bulk feed truck would be sufficient to handle feed distribution due to the short hauling distances. It was assumed that ten 20-ton loads of feed would be delivered each day. Each delivery would require an average round-trip time of 40 minutes and would cover an average distance of 0.9 mile.

Investment.—The only investment required for the feed distribution function would be $38,000 for a feed truck. As in the decentralized complex, no spare truck was included because of the high cost and the flexibility of the tractor-trailer truck.

Operating Costs.—Feed distribution costs would be minor for the owner-integrator, amounting to less than $29,000 a year. Variable costs would represent 62 percent of the total, with nearly half of these accounted for by truck driver costs. Truck depreciation is the major fixed cost. Detailed cost estimates are presented in appendix table 12. Operating costs are:

Type of cost	*Cost per year*	*Cost per ton*
Fixed	$10,970	$0.21
Variable	17,722	.34
Total	28,692	.55

Pullet Growing

The centralized complex would produce started pullets for its laying operations in sixteen 32,000-bird pullet houses with a total capacity of 512,000 birds. The pullet growing period was assumed to be 20 weeks, after which the pullets would be moved to the laying houses. Pullet houses would remain empty for 3 weeks between flocks to allow time for cleaning and sanitizing. With this schedule, 2.26 flocks a year could be produced in each house.

Mortality and cockerel loss was assumed to be 6 percent of house capacity, or 8 percent of chicks caged, assuming a 2-percent overage of chicks placed in the house. Based on this mortality and the schedule of house use, the complex would produce 1,087,696 started pullets a year.

Three different rations would be used in a phase feeding program, with total feed consumption assumed to be 15.5 pounds per pullet produced. Feed would be delivered to the houses in 20-ton loads, so an average feed inventory of 10 tons would be maintained at each house.

Employee requirements were assumed to be 1 full-time person (8 hours a day) for each 120,000 birds. Thus, 34 man-hours of labor would be required each day.

Investment.—The total investment in pullet growing was estimated at more than $1.35 million. More than three-fourths of this amount would be tied up in buildings and equipment to house the birds. The model pullet houses were the same as those assumed to be used by the decentralized complex. Investments are:

Item	*Investment*
Pullet houses and equipment	$1,052,800
Chicks	184,320
Land and improvements	97,216
Feed inventory	19,734
Total	1,354,070

Operating Costs.—The owner-integrator would incur total costs of nearly $1.8 million a year in the production of started pullets. This represents a cost of about $1.63 per pullet produced. Operating costs are:

Type of cost	*Cost per year*	*Cost per pullet*
Fixed	$ 162,212	$0.1491
Variable	1,614,431	1.4843
Total	1,776,643	1.6334

Nearly 91 percent of pullet growing costs are variable. Together, feed and chicks make up 90 percent of variable costs and 82 percent of total costs. Detailed cost estimates are presented in appendix table 13.

Egg Production

The centralized complex would produce eggs in forty 30,000-bird laying houses located on its central farm. The egg production cycle would start with the placement of complex-produced 20-week-old started pullets in the laying house. These birds would be kept in the laying house for 56 weeks. A 3-week vacancy period for cleaning and sanitizing the houses between flocks would complete the production cycle.

The rate of lay over the production period was assumed to be 240 eggs per bird housed. For the 56 weeks birds are in the laying house, this is equivalent to 0.6090677 egg per hen housed per day. The complex would produce 21,119,422 dozen eggs annually, based on an average of 1,140,000 hens housed each year.

The complex was assumed to have a feed conversion ratio of 4.116 pounds of feed per dozen eggs using a

two-ration phase feeding program. Total feed consumption during the production period would be 82.32 pounds per bird housed, or an average of 21 pounds a day for each 100 birds housed. Feed would be delivered to each house in 20-ton loads, and it was assumed that the complex would keep an average inventory of 10 tons at each house.

The complex was assumed to have average spent hen sales of 922,663 birds annually. This was based on average bird mortality of 1 percent a month of birds housed. An average weight of 3.6 pounds per bird and a March 1974 fowl price of 7 cents a pound were used to estimate complex income from spent hen sales.

The labor required to carry on the centralized egg production operation was estimated at a total of 185 man-hours a day. This was based on: (1) 3 full-time employees for each 10 houses to care for the chickens; (2) 1 full-time employee for each 10 houses to operate the egg collection belts; and (3) 10 man-hours per house per week to provide for manure removal.

Investment.—The centralized egg production function would require an estimated total investment of $7.4 million. Started pullets would represent about one-fourth of the total investment and layer housing (buildings and equipment) would account for a little more than two-thirds. Investments are:

Item	*Investment*
Layer houses and equipment	$5,060,000
Started pullets	1,960,080
Land and improvements	328,848
Feed inventory	50,196
Total	7,399,124

The model laying houses for the centralized complex would be environment-controlled, cage houses with automatic feeding and watering, belt egg collection, and storage for 22 tons of feed. They would be identical to the decentralized model houses except they would have no vacuum packing unit. Instead, the egg belts in each house would feed into a common assembly belt that would carry the eggs directly to the processing machines in the packing plant.

Based on early 1974 costs, the 30,000-bird model house was estimated to cost $126,500, including the cost of building and equipment. The cost of the vacuum packers not included in these houses was assumed to offset the cost of the common egg assembly belt system.

Operating Costs.—The owner-integrator's egg production costs would total $8.4 million annually, or almost 39.7 cents a dozen. Income from spent hen sales would reduce net costs to about $8.1 million a year, or nearly 38.6 cents a dozen. Operating costs are:

Type of cost	*Cost per year*	*Cost per dozen*
Fixed	$ 842,600	$0.03990
Variable	7,536,659	.35686
Total	8,379,259	.39676
Less: Spent fowl income	−232,511	−.01101
Total, net	8,146,748	.38575

Variable costs would represent nearly nine-tenths of total costs, with the most important of these being feed (67 percent) and started pullets (21 percent). Employee costs would account for only 2.5 percent of total costs. Depreciation and interest on investment would make up 94 percent of fixed costs. Detailed cost estimates are presented in appendix table 14.

Egg Processing

The centralized complex was assumed to wash, candle, grade, and package 13,501 cases of eggs a week in its egg packing plant. The model packing plant would have 4 egg processing machines with a designed capacity of 70 cases an hour per machine. The maximum effective output per machine was assumed to be 65 cases an hour.

The plant would be operated 8 hours a day, 7 days a week. A total of 21,119,422 dozen eggs would be processed annually. Marketings would total only 20,697,034 dozen, however, because a 2-percent processing loss was assumed.

Seventy percent of the eggs would be packaged in consumer cartons and 30 percent loose in cases. The plant would carry an average egg inventory of 2 days' processing volume, all processed eggs. On the average, a 5-week supply of packaging materials and a 9-week stock of plant supplies would be kept in inventory.

Investment.—The estimated investment for egg processing would total $1.4 million. Buildings and equipment would account for $1.2 million, or 86 percent of total investment. Investments are:

Item	*Investment*
Equipment	$ 613,668
Buildings	604,204
Egg and supplies inventories	130,632
Land and improvements	40,672
Sewage disposal system	33,000
Total	1,422,176

The processing building for which costs were estimated included a processing room for 4 egg packing machines, a 7,500-case egg cooler, dry storage, office space, employee facilities, and a standby generator room. The buildings cost estimate also included a single-bay vehicle maintenance garage.

The major equipment cost was for the four egg processing machines, including egg orienters and egg washers. Also included in equipment costs were five 175-kilowatt standby diesel generators that would be used as an emergency power supply for the complex.

More detailed estimates of the processing plant cost are presented in appendix table 15.

Operating Costs.—The estimated cost of processing eggs in the centralized system would total nearly $1.4 million a year, or about 6.5 cents a dozen for the 21.1 million dozen processed. A very large proportion of these costs would be variable. Packaging materials alone would account for 56 percent of total costs. Payroll and employee benefits would add another 28 percent. Detailed egg processing cost estimates are presented in appendix tables 16 and 17. Operating costs are:

Type of cost	*Cost per year*	*Cost per dozen*
Fixed	$ 177,686	$0.00841
Variable	1,193,875	.05653
Total	1,371,561	.06494

Administration

An owner-integrator would incur an estimated total of $185,333 a year in overhead expenses for administering the operations of a centralized complex. This is equivalent to about 0.88 cent a dozen eggs produced.

The cost of centralized complex administration was estimated in two parts. General expenses were estimated at 0.8 cent a dozen eggs produced, the same as the administrative overhead cost used in the decentralized model. They would cover the costs of a complex manager, a production manager, secretarial and clerical support, office expenses, and other expenses not directly allocable to specific complex functions. To this general expense was added the costs of an assistant production manager and the operating costs for a production department vehicle. More detailed cost estimates are presented in appendix table 18.

Total Complex Costs

An owner-integrator would have to make a total investment estimated at $10.8 million to build and operate a centralized egg complex (table 7). Nearly $8.8 million, or 81 percent of the total, would be invested in pullet growing and egg production. This investment does not include working capital other than that needed to finance inventories.

Centralized complex operating costs are estimated to total $9,703,642 a year—nearly $49,000 less than the decentralized complex costs. These costs would amount to 45.947 cents a dozen eggs produced or 46.884 cents a dozen eggs processed, based on a 2-percent processing loss. Nearly 84 percent of the complex's processed egg cost would be tied up in producing eggs. Total operating costs are summarized in appendix table 19.

As is true for the decentralized complex, a high proportion of centralized complex operating costs are variable. Almost 88 percent of operating costs represents essentially cash outlays during the production period that the complex must cover in the short run. If it is to remain in business over the long run, however, the centralized complex also must cover the 12 percent of costs that are fixed.

Centralized complex income would have to cover annual interest charges of $539,761 to provide an 8-percent return on the owner-integrator's $10.8 million investment (table 7). These interest charges would represent nearly 45 percent of the complex's fixed operating costs.

Table 7—Estimated total investment in a centralized complex and annual interest charged to complex functions to provide a return on investment of 8 percent a year

Complex function	Total investment	Annual interest
	Dollars	
Feed processing	598,985	28,999
Feed distribution	38,000	1,520
Pullet growing	1,354,070	64,042
Egg production	7,399,124	381,352
Egg processing	1,422,176	63,740
Administration	2,700	108
Total	10,815,055	539,761

APPENDIX

Appendix table 1—Estimated decentralized complex feed processing costs[1]

Cost item	Feed processing costs	
	Annual	Per ton[2]
	Dollars	
Fixed:		
Depreciation:		
Facilities[3]	13,200	0.25
Equipment[4]	13,933	27
Interest on investment:		
Facilities and equipment[5]	18,920	.36
Land[6]	1,600	.03
Ingredient inventory[7]	7,737	.15
Taxes[8]	6,409	.12
Insurance[9]	4,730	.09
Total	66,529	1.27
Variable:		
Salaries and wages:		
Supervisory[10]	12,000	.23
Production[11]	44,907	.86
Maintenance[12]	7,488	.14
Employee benefits[13]	8,049	.15
Utilities[14]	15,678	.30
Maintenance and repairs[15]	25,740	.49
Supplies[16]	6,794	.13
Inventory shrink[17]	8,884	.17
Ingredient purchasing	18,500	.35
Miscellaneous[18]	13,065	.25
Total	161,105	3.08
Grand total	227,634	4.36

[1] Based on early 1974 costs.
[2] Based on annual production of 52,260 tons of feed.
[3] Feed mill facilities cost of $264,000 depreciated over 20 years.
[4] Feed mill equipment cost of $209,000 depreciated over 15 years.
[5] Computed at 8 percent per year on the average undepreciated value of facilities and equipment, or half the original cost ($473,000 ÷ 2).
[6] Computed at 8 percent per year on investment of $20,000 in 4 acres of land.
[7] Computed at 8 percent per year on the March 1974 value of the assumed average feed ingredient inventory of 4 days' production (804 tons at $120.30 a ton).
[8] Estimated at 1.3 percent of $493,000 investment in facilities, equipment, and land and improvements.
[9] Estimated at 1 percent of $473,000 investment in facilities and equipment.
[10] 1 plant supervisor at $12,000 a year.
[11] 3 employees at $3.45 an hour on day shift, 2 production employees at $3.62 an hour, and 1 production/supervisory employee at $4.00 an hour on night shift.
[12] 1 maintenance employee at $3.60 an hour.
[13] Estimated at 12.5 percent of salaries and wages.
[14] Estimated at $0.30 a ton of feed produced.
[15] Estimated at 5 percent of $264,000 facilities cost plus 6 percent of $209,000 equipment cost.
[16] Estimated at $0.13 a ton of feed produced.
[17] Estimated at $0.17 a ton of feed produced.
[18] Estimated at $0.25 a ton of feed produced.

Appendix table 2—Estimated decentralized complex feed distribution costs[1]

Cost item	Feed distribution costs	
	Annual	Per ton[2]
	Dollars	
Fixed:		
Depreciation, trucks[3]	15,200	0 29
Interest on truck investment[4]	3,040	.06
Insurance[5]	1,600	.03
Licenses and taxes[6]	2,100	.04
Total	21,940	.42
Variable:		
Driver wages[7]	17,290	.33
Employee benefits[8]	2,161	.04
Truck maintenance and repairs[9]	9,828	.19
Fuel, oil, and lube[10]	9,360	.18
Tires and tubes[11]	1,123	.02
Total	39,762	.76
Grand total	61,702	1.18

[1] Based on early 1974 costs.
[2] Based on 52,260 tons distributed annually.
[3] Two 24 ton tractor-trailer trucks at $38,000 each depreciated over 5 years.
[4] Computed at 8 percent per year on the average undepreciated truck value, or half the original cost ($76,000 ÷ 2).
[5] Estimated at $800 per truck.
[6] Estimated at $1,050 per truck.
[7] Two drivers at $3.50 an hour for 40 hours a week and $5.25 an hour for 5 hours a week.
[8] Estimated at 12.5 percent of wages.
[9] Estimated at $0.105 a mile on 46,800 miles per truck.
[10] Estimated at $0.10 a mile on 46,800 miles per truck.
[11] Estimated at $0.012 a mile on 46,800 miles per truck.

Appendix table 3—Estimated decentralized complex pullet growing costs[1]

Cost item	Pullet growing costs	
	Annual	Per pullet[2]
	Dollars	
Fixed:		
Depreciation:		
Buildings[3]	36,053	0.0331
Equipment[4]	51,200	.0471
Interest on investment:		
Buildings and equipment[5]	41,112	.0387
Chicks[6]	12,784	.0118
Feed inventory[7]	1,377	.0013
Land and improvements[8]	5,248	.0048
Taxes[9]	4,474	.0041
Insurance[10]	6,317	.0058
Total	159,565	.1467
Variable:		
Feed[11]	1,045,613	.9613
Chicks[12]	416,563	.3830
Maintenance and repairs[13]	10,528	.0097
Sanitation[14]	1,600	.0015
Cleaning[15]	9,600	.0088
Utilities[16]	15,288	.0140
Medication[17]	25,017	.0230
Supplies[18]	4,800	.0044
Debeaking[19]	21,754	.0200
Pullet moving[20]	38,069	.0350
Total	1,588,772	1.4607
Grand total	1,748,772	1.6074

[1] Based on early 1974 costs.

[2] Total annual production of 1,087,696 started pullets based on one time capacity of 512,000 birds, 2.26 flocks per producer per year, and 6 percent mortality and cockerel loss.

[3] 16 pullet houses at $33,800 each depreciated over 15 years.

[4] Equipment in 16 pullet houses at $32,800 per house depreciated over 10 years.

[5] Computed at 8 percent per year on the average undepreciated value, or half the original cost ($1,052,800 ÷ 2).

[6] Computed at 8 percent per year on investment of $184,320 in 512,000 chicks for 0.867 year.

[7] Computed at 8 percent per year on the March 1974 value of the average feed inventory (10 tons at $124.04 a ton) held on each contract grower's farm for 0.867 year.

[8] Computed at 8 percent per year on investment of $600 in 1 acre of land plus $3,500 in improvements on each contract grower's farm.

[9] Estimated at 0.4 percent of $1,118,400 investment in buildings, equipment, and land and improvements.

[10] Estimated at 0.6 percent of $1,052,800 investment in buildings and equipment.

[11] Based on 15.5 pounds of feed per pullet produced and March 1974 feed cost of $124.04 a ton. Feed cost includes feed ingredient, processing, and distribution costs.

[12] Based on 1,157,120 chicks purchased annually and a March 1974 cost of $0.36 a chick.

[13] Estimated at 1 percent of $1,052,800 investment in buildings and equipment.

[14] Estimated at $100 per year per house.

[15] Estimated at $600 per year per house.

[16] Estimated at $0.014 per pullet produced.

[17] Estimated at $0.023 per pullet produced.

[18] Estimated at $300 per contract grower.

[19] Estimated at $0.02 per pullet produced for 1 debeaking at 8-10 weeks of age.

[20] Estimated at $0.035 per pullet produced for catching ($.0125 per pullet), trucking ($0.01 per pullet), and caging ($.0125 per pullet).

Appendix table 4—Estimated decentralized complex egg production costs[1]

Cost item	Egg production costs	
	Annual	Per dozen[2]
	Dollars	
Fixed:		
Depreciation:		
Buildings[3]	193,333	0.00915
Equipment[4]	216,000	.01023
Interest on investment:		
Buildings and equipment[5]	202,400	.00958
Pullets[6]	146,464	.00694
Feed inventory[7]	3,830	.00018
Land and improvements[8]	13,120	.00062
Taxes[9]	20,896	.00099
Insurance[10]	30,360	.00144
Total	826,403	.03913
Variable:		
Feed[11]	5,484,693	.25970
Pullets[12]	1,704,700	.08072
Maintenance and repairs[13]	50,600	.00240
Sanitation[14]	2,000	.00009
Cleaning[15]	7,040	.00033
Utilities[16]	60,000	.00284
Medication[17]	14,847	.00070
Supplies[18]	8,000	.00038
Miscellaneous[19]	4,000	.00019
Total	7,335,800	.34735
Grand total	8,162,283	.38648
Less: Spent fowl income[20]	−232,511	−.01101
Grand total, net	7,929,772	.37547

[1] Based on early 1974 costs.

[2] Total annual production of 21,119,422 dozen eggs was based on 240 eggs produced per hen housed during a 56-week production period, or an average of 0.6090677 egg per hen housed per day. On the average, 38 layer houses with a total capacity to house 1,140,000 hens would be occupied at any one time.

[3] 40 layer houses at $72,500 each depreciated over 15 years.

[4] Equipment in 40 layer houses at $54,000 per house depreciated over 10 years.

[5] Computed at 8 percent per year on the average undepreciated value of 40 layer houses and equipment, or half the original cost ($5,060,000 ÷ 2).

[6] Computed at 8 percent per year on investment of $1,928,880 in 1,200,000 started pullets for 0.949 year.

[7] Computed at 8 percent per year on the March 1974 value of the assumed average feed inventory (10 tons at $126.19 a ton) held on each contract producer's farm for 0.949 year.

[8] Computed at 8 percent per year on investment of $600 in 1 acre of land plus $3,500 in improvements on each contract producer's farm.

[9] Estimated at 0.4 percent of $5,224,000 investment in buildings, equipment, and land and improvements.

[10] Estimated at 0.6 percent of $5,060,000 investment in buildings and equipment.

[11] Based on 4.116 pounds of feed per dozen eggs produced and March 1974 estimated feed cost of $126.19 a ton delivered to contract producers' farms. Feed cost includes feed ingredient, processing, and distribution costs.

[12] Based on 1,060,533 started pullets housed annually at a transfer cost of $1.6074 each.

[13] Estimated at 1 percent of $5,060,000 investment in buildings and equipment.

[14] Estimated at $50 per house per year.

[15] Estimated at $200 per flock (100 man-hours at $2.00 per man-hour), or $176 per house per year.

[16] Estimated at $0.05 per bird capacity per year.

[17] Estimated at $0.014 per bird capacity per year.

[18] Estimated at $200 per house per year.

[19] Estimated at $100 per house per year.

[20] Based on a March 1974 price of $0.07 a pound for 922,663 spent hens sold per year at an average weight of 3.6 pounds per hen. Mortality estimated at 1 percent per month of birds housed.

Appendix table 5—Estimated decentralized complex field service costs[1]

Cost item	Field service costs	
	Annual	Per dozen[2]
	Dollars	
Fixed:		
Vehicle depreciation[3]	3,500	0.00017
Interest on vehicle investment[4]	420	.00002
Insurance and licenses[5]	495	.00002
Total	4,415	.00021
Variable:		
Salaries[6]	40,000	.00189
Employee benefits[7]	5,000	.00024
Tires, maintenance, and repairs[8]	1,200	.00006
Fuel, oil, and lube[9]	4,575	.00022
Total	50,775	.00240
Grand total	55,190	.00261

[1] Based on early 1974 costs.
[2] Based on 21,119,422 dozen eggs produced annually.
[3] 3 cars at $3,500 each depreciated over 3 years.
[4] Computed at 8 percent per year on the average undepreciated value, or half the original cost ($10,500 ÷ 2).
[5] Estimated at $150 per car per year for insurance and $15 per car for licenses.
[6] One supervisor at $15,000 and 2 servicemen at $12,500 each annually.
[7] Estimated at 12.5 percent of salaries.
[8] Estimated at $400 a car annually.
[9] Estimated at $0.061 a mile for 3 cars each driven 25,000 miles a year.

Appendix table 6—Estimated decentralized complex egg assembly costs[1]

Cost item	Egg assembly costs	
	Annual	Per dozen[2]
	Dollars	
Fixed:		
Depreciation:		
Trucks[3]	16,080	0.00076
Egg racks[4]	21,583	.00102
Interest on investment:		
Trucks[5]	3,216	.00015
Egg racks[6]	2,590	.00012
Insurance[7]	1,700	.00008
Licenses and taxes[8]	2,100	.00010
Total	47,269	.00224
Variable:		
Wages[9]	18,500	.00088
Employee benefits[10]	2,313	.00011
Maintenance and repairs[11]	4,500	.00021
Fuel, oil, and lube[12]	7,500	.00036
Tires and tubes[13]	900	.00004
Total	33,713	.00160
Grand total	80,982	.00383

[1] Based on early 1974 costs.
[2] Based on 21,119,422 dozen eggs produced annually.
[3] 2 45-foot refrigerated tractor-trailer trucks with hydraulic tailgates at $40,200 each depreciated over 5 years.
[4] 925 egg racks at $70 each depreciated over 3 years.
[5] Computed at 8 percent per year on the average undepreciated truck value, or half the original cost ($80,400 ÷ 2).
[6] Computed at 8 percent per year on the average undepreciated value, or half the original cost ($64,750 ÷ 2).
[7] Estimated at $850 per truck.
[8] Estimated at $1,050 per truck.
[9] 2 drivers at $3.75 an hour for 40 hours a week and $5.62 an hour for 5 hours a week.
[10] Estimated at 12.5 percent of wages.
[11] Estimated at $0.06 a mile on 37,500 miles per truck.
[12] Estimated at $0.10 a mile on 37,500 miles per truck.
[13] Estimated at $0.012 a mile on 37,500 miles per truck.

Appendix table 7—Estimated egg processing plant costs for a decentralized complex[1]

Cost item	Dollars
Land and improvements:	
Land (6 acres)	33,000
Improvements	132,000
Total	165,000
Buildings:	
Processing building	612,216
Truck maintenance garage	30,998
Total	643,214
Processing equipment:[2]	
4 70-case per hour egg processing machines[3]	396,000
2 tow motors	6,600
1 high lift	9,900
Boiler	1,100
Equipment plumbing and wiring	7,700
Miscellaneous equipment	3,300
Total	424,600
Plant equipment:[2]	
Garage equipment	4,400
Fuel tanks	3,300
Heating and air conditioning	64,163
Refrigeration	44,387
Electric service and substation	19,800
Miscellaneous	605
Total	136,655
Office equipment	3,300
Grand total	1,372,769

[1] Based on early 1974 costs.
[2] Includes installation cost where applicable.
[3] Includes vacuum loaders, egg washers, and plastic flat washers.

Appendix table 8—Estimated decentralized complex egg processing costs[1]

Cost item	Egg processing costs	
	Annual	Per dozen[2]
	Dollars	
Fixed:		
Depreciation:		
Buildings[3]	32,161	0.00152
Processing equipment[4]	53,075	.00251
Plant equipment[5]	9,156	.00043
Office equipment[6]	495	.00002
Interest on investment:		
Buildings and equipment[7]	48,311	.00229
Land and improvements[8]	13,200	.00063
Egg inventory[9]	5,715	.00027
Supplies inventory[10]	7,519	.00036
Taxes[11]	17,846	.00085
Insurance[12]	12,078	.00057
Total	199,556	.00945
Variable:		
Packaging materials[13]	780,574	.03696
Salaries and wages[14]	369,087	.01748
Employee benefits[15]	46,136	.00218
Maintenance and repairs[16]	42,272	.00200
Utilities[17]	31,679	.00150
Plant supplies[18]	19,007	.00090
Inspection and grading[19]	29,379	.00139
Total	1,318,134	.06241
Grand total	1,517,690	.07186

[1] Based on early 1974 costs.
[2] Based on 21,119,422 dozen processed.
[3] Buildings cost of $643,214 depreciated over 20 years.
[4] Processing equipment cost of $424,600 depreciated over 8 years.
[5] Plant equipment cost of $136,655 depreciated over 15 years.
[6] Office equipment costs of $1,650 depreciated over 10 years and $1,650 over 5 years.
[7] Computed at 8 percent per year on the average undepreciated value of buildings and equipment, or half the original cost ($1,207,769 ÷ 2).
[8] Computed at 8 percent per year on investment of $33,000 in 6 acres of land and $132,000 in land improvements.
[9] Computed at 8 percent per year on the assumed average inventory of 1,800 cases of ungraded eggs and 3,600 cases of graded eggs valued at cost.
[10] Computed at 8 percent per year on the assumed average inventories of 5 weeks' supply of packaging materials valued at $90,710 and 9 weeks' supply of plant supplies valued at $3,281.
[11] Estimated at 1.3 percent of $1,372,769 investment in buildings, equipment, and land and improvements.
[12] Estimated at 1 percent of $1,207,769 investment in buildings and equipment.
[13] Estimated at an average of $0.03696 a dozen, or $0.04285 a dozen for the 70 percent of eggs cartoned and $0.02321 a dozen for the 30 percent of eggs sold loose in cases.
[14] See app. table 9.
[15] Estimated at 12.5 percent of salaries and wages.
[16] Estimated at 3.5 percent of $1,207,769 investment in buildings and equipment.
[17] Estimated at $0.0015 a dozen eggs processed.
[18] Estimated at $0.0009 a dozen eggs processed.
[19] Based on 2 inspectors, 1 for each shift.

Appendix table 9—Employee requirements and costs for a decentralized complex egg processing plant[1]

Position	Number of employees[2]	Length of work week	Hourly wage rate[3]	Annual cost
	Number	*Hours*	*Dollars*	
Plant manager	1			16,000
1st shift:				
Foreman	1			10,500
Loader	4	40	2.90	24,128
Candler	8	40	2.50	41,600
Packer	8	40	2.50	41,600
Machine operator	4	40	2.50	20,800
Case setup	1	40	2.50	5,200
Maintenance	1	48	5.00	13,520
Carton supply	1	46	3.10	7,899
Materials handler	4	45	3.00	29,640
Dock man	4	50	3.50	40,040
2nd shift:				
Foreman	1			11,025
Loader	2	40	3.05	12,688
Candler	4	40	2.63	21,882
Packer	4	40	2.63	21,882
Machine operator	2	40	2.63	10,941
Case setup	1	40	2.63	5,471
Carton supply	1	46	3.26	8,307
Materials handler	2	45	3.15	15,564
3d shift:				
Cleanup	2	40	2.50	10,400
Total	56	--	--	369,087

[1] Based on early 1974 costs.
[2] Based on operating 4 machines during first shift and 2 machines during second shift.
[3] Time and one-half paid for work in excess of 40 hours a week and 5 percent wage differential paid for second shift work.
- - = not applicable.

Appendix table 10—Estimated total cost of producing and processing eggs in a decentralized complex[1]

Complex function	Total annual cost	Cost per dozen eggs produced[2]	Cost per dozen eggs marketed[3]
		Dollars	
Feed processing	[4]227,634	[5]	[5]
Feed distribution	[4]61,702	[5]	[5]
Pullet growing	[4]1,748,337	[5]	[5]
Egg production	7,929,772	0.37547	0.38314
Field service	55,190	.00261	.00267
Egg assembly	80,982	.00383	.00391
Egg processing	1,517,690	.07186	.07333
Administrative overhead[6]	168,955	.00800	.00816
Total	[7]9,752,589	.46178	.47121

[1] Based on early 1974 costs.
[2] Based on 21,119,422 dozen eggs produced annually.
[3] Based on 20,697,034 dozen eggs marketed annually, assuming 2 percent loss in processing.
[4] Included in total cost for egg production function.
[5] Not applicable.
[6] Computed at $0.008 per dozen eggs produced.
[7] Does not include costs shown for feed processing, feed distribution, and pullet growing because they are included in egg production costs.

Appendix table 11—Estimated centralized complex feed processing costs[1]

Cost item	Feed processing costs	
	Annual	Per ton[2]
	Dollars	
Fixed:		
Depreciation:		
Facilities[3]	13,200	0.25
Equipment[4]	13,933	.27
Interest on investment:		
Facilities and equipment[5]	18,920	.36
Land and improvements[6]	2,341	.04
Ingredient inventory[7]	7,738	.15
Taxes[8]	2,009	.04
Insurance[9]	4,730	.09
Total	62,871	1.20
Variable:		
Salaries and wages:		
Supervisory[10]	12,000	.23
Production[11]	44,907	.86
Maintenance[12]	7,488	.14
Employee benefits[13]	8,049	.15
Utilities[14]	15,678	.30
Maintenance and repairs[15]	25,740	.49
Supplies[16]	6,794	.13
Inventory shrink[17]	8,884	.17
Ingredient purchasing	18,500	.35
Miscellaneous[18]	13,065	.25
Total	161,105	3.08
Grand total	223,976	4.29

[1] Based on early 1974 costs.
[2] Based on annual production of 52,260 tons of feed.
[3] Feed mill facilities cost of $264,000 depreciated over 20 years.
[4] Feed mill equipment cost of $209,000 depreciated over 15 years.
[5] Computed at 8 percent per year on the average undepreciated value of facilities and equipment, or half the original cost ($473,000 ÷ 2).
[6] Computed at 8 percent per year on $29,264, a prorated share of the complex investment of $496,000 in 180 acres of land and improvements.
[7] Computed at 8 percent per year on the March 1974 value of the assumed average feed ingredient inventory of 4 day's production (804 tons at $120.30 a ton).
[8] Estimated at 0.4 percent of $502,264 investment in facilities, equipment, and land and improvements.
[9] Estimated at 1 percent of $473,000 investment in facilities and equipment.
[10] 1 plant supervisor at $12,000 a year.
[11] 3 employees at $3.45 an hour on day shift. 2 production employees at $3.62 an hour, and 1 production/supervisory employee at $4.00 an hour on night shift.
[12] 1 maintenance employee at $3.60 an hour.
[13] Estimated at 12.5 percent of salaries and wages.
[14] Estimated at $0.30 a ton of feed produced.
[15] Estimated at 5 percent of $264,000 facilities cost plus 6 percent of $209,000 equipment cost.
[16] Estimated at $0.13 a ton of feed produced.
[17] Estimated at $0.17 a ton of feed produced.
[18] Estimated at $0.25 a ton of feed produced.

Appendix table 12—Estimated centralized complex feed distribution costs[1]

Cost item	Feed distribution costs	
	Annual	Per ton[2]
	Dollars	
Fixed		
Depreciation, truck[3]	7,600	0 15
Interest on truck investment[4]	1,520	.03
Insurance[5]	800	.02
Licenses and taxes[6]	1,050	.02
Total	10,970	.21
Variable:		
Driver wages[7]	7,280	.14
Employee benefits[8]	910	.02
Truck maintenance and repairs[9]	4,703	.09
Fuel, oil, and lube[10]	4,479	.09
Tires and tubes[11]	350	.01
Total	17,722	.34
Grand total	28,692	.55

[1] Based on early 1974 costs.
[2] Based on 52,260 tons distributed annually.
[3] One 24-ton tractor-trailer truck at $38,000 depreciated over 5 years.
[4] Computed at 8 percent per year on the average undepreciated truck value, or half the original cost ($76,000 ÷ 2).
[5] Estimated at $800 per truck.
[6] Estimated at $1,050 per truck.
[7] 1 driver at $3.50 an hour for 40 hours a week.
[8] Estimated at 12.5 percent of wages.
[9] Estimated at $2.70 per hour of truck operation, or $2.03 per mile on 2,317 miles per year.
[10] Estimated at $2.57 per hour of truck operation, or $1.93 per mile on 2,317 miles per year.
[11] Estimated on basis of complete tire replacement every 5 years.

Appendix table 13—Estimated centralized complex pullet growing costs[1]

Cost item	Pullet growing costs	
	Annual	Per pullet[2]
	Dollars	
Fixed:		
Depreciation:		
Buildings[3]	36,053	0.0331
Equipment[4]	51,200	.0471
Interest on investment:		
Buildings and equipment[5]	42,112	.0387
Chicks[6]	12,784	.0118
Feed inventory[7]	1,369	.0013
Land and improvements[8]	7,777	.0072
Taxes[9]	4,600	.0042
Insurance[10]	6,317	.0058
Total	162,212	.1491
Variable:		
Feed[11]	1,039,712	.9559
Chicks[12]	416,563	.3830
Wages[13]	32,887	.0302
Employee benefits[14]	4,111	.0038
Maintenance and repairs[15]	10,528	.0097
Sanitation[16]	1,600	.0015
Cleaning[17]	9,600	.0088
Utilities[18]	15,228	.0140
Medication[19]	25,017	.0230
Supplies[20]	4,800	.0044
Debeaking[21]	21,754	.0200
Pullet moving[22]	32,631	.0300
Total	1,614,431	1.4843
Grand total	1,776,643	1.6334

[1] Based on early 1974 costs.

[2] Total annual production of 1,087,696 started pullets based on one-time capacity of 512,000 birds, 2.26 flocks per year, and 6 percent mortality and cockerel loss.

[3] 16 pullet houses at $33,800 each depreciated over 15 years.

[4] Equipment in 16 pullet houses at $32,000 per house depreciated over 10 years.

[5] Computed at 8 percent per year on the average undepreciated value, or half the original cost ($1,052,800 ÷ 2).

[6] Computed at 8 percent per year on investment of $184,320 in 512,000 chicks for 0.867 year.

[7] Computed at 8 percent per year on the March 1974 value of the average feed inventory (10 tons at $123.34 a ton) held in storage tanks at each pullet house for 0.949 year.

[8] Computed at 8 percent per year on $97,216, a prorated share of the complex investment of $496,000 in 180 acres of land and improvements.

[9] Estimated at 0.4 percent of $1,150,016 investment in buildings, equipment, and land and improvements.

[10] Estimated at 0.6 percent of $1,052,800 investment in buildings and equipment.

[11] Based on 15.5 pounds of feed per pullet produced and March 1974 feed cost of $123.34 a ton. Feed cost includes feed ingredient, processing, and distribution costs.

[12] Based on 1,157,120 chicks purchased annually and a March 1974 cost of $0.36 a chick.

[13] Based on 1 employee for each 120,000 birds, or 34 hours of labor a day for 512,000 birds. Wage rate was estimated at $2.65 an hour.

[14] Estimated at 12.5 percent of wages.

[15] Estimated at 1 percent of $1,052,800 investment in buildings and equipment.

[16] Estimated at $100 per year per house.

[17] Estimated at $600 per year per house.

[18] Estimated at $0.014 per pullet produced.

[19] Estimated at $0.023 per pullet produced.

[20] Estimated at $300 per year per house.

[21] Estimated at $0.02 per pullet produced for 1 debeaking at 8-10 weeks of age.

[22] Estimated at $0.03 per pullet produced for catching ($0.0125 per pullet), transporting ($0.005 per pullet), and caging ($0.0125 per pullet).

Appendix table 14—Estimated centralized complex egg production costs[1]

Cost item	Egg production costs	
	Annual	Per dozen[2]
	Dollars	
Fixed:		
Depreciation:		
Buildings[3]	193,333	0.00915
Equipment[4]	216,000	.01023
Interest on investment:		
Buildings and equipment[5]	202,400	.00958
Pullets[6]	148,833	.00705
Feed inventory[7]	3,811	.00018
Land and improvements[8]	26,308	.00125
Taxes[9]	21,555	.00102
Insurance[10]	30,360	.00144
Total	842,600	.03990
Variable:		
Feed[11]	5,454,268	.25826
Pullets[12]	1,732,275	.08202
Wages[13]	178,941	.00847
Employee benefits[14]	22,368	.00106
Maintenance and repairs[15]	50,600	.00240
Sanitation[16]	2,000	.00009
Cleaning[17]	9,360	.00044
Utilities[18]	60,000	.00284
Medication[19]	14,847	.00070
Supplies[20]	8,000	.00038
Miscellaneous[21]	4,000	.00019
Total	7,536,659	.35686
Grand total	8,379,259	.39676
Less: Spent fowl income[22]	−232,511	−.01101
Grand total, net	8,146,748	.38575

[1] Based on early 1974 costs.

[2] Total annual production of 21,119,422 dozen eggs was based on 240 eggs produced per hen housed during a 56-week production period, or an average of 0.6090677 egg per hen housed per day. On the average, 38 layer houses with a total capacity to house 1,140,000 hens would be occupied at any one time.

[3] 40 layer houses at $72,500 each depreciated over 15 years.

[4] Equipment in 40 layer houses at $54,000 per house depreciated over 10 years.

[5] Computed at 8 percent per year on the average undepreciated value of 40 layer houses and equipment, or half the original cost ($5,060,000 ÷ 2).

[6] Computed at 8 percent per year on investment of $1,960,080 in 1,200,000 started pullets for 0.949 year.

[7] Computed at 8 percent per year on the March 1974 value of the assumed average feed inventory (10 tons at $125.49 a ton) held in storage tanks at each layer house for 0.949 year.

[8] Computed at 8 percent per year on $328,848, a prorated share of the complex investment of $496,000 in 180 acres of land and improvements.

[9] Estimated at 0.4 percent of $5,388,848 investment in buildings, equipment, and land and improvements.

[10] Estimated at 0.6 percent of $5,060,000 investment in buildings and equipment.

[11] Based on 4.116 pounds per dozen eggs produced and March 1974 estimated feed cost of $125.49 a ton. Feed cost includes feed ingredient, processing, and distribution costs.

[12] Based on 1,060,533 started pullets housed annually at a transfer cost of $1.6334 each.

[13] Based on 12 employees to tend layers, 4 employees to monitor egg collection belts, and 57 man-hours a day for manure removal, or a total of 185 man-hours a day. Wage rate was estimated at $2.65 an hour.

[14] Estimated at 12.5 percent of wages.

[15] Estimated at 1 percent of $5,060,000 investment in buildings and equipment.

[16] Estimated at $50 per house per year.

[17] Estimated at $234 per house per year.

[18] Estimated at $0.05 per bird capacity per year.

[19] Estimated at $0.014 per bird capacity per year.

[20] Estimated at $200 per house per year.

[21] Estimated at $100 per house per year.

[22] Based on March 1974 price of $0.07 a pound for 922,663 spent hens sold per year at an average weight of 3.6 pounds per hen. Mortality estimated at 1 percent per month of birds housed.

Appendix table 15—Estimated egg processing plant costs for a centralized complex[1]

Cost item	Dollars
Buildings:	
Processing building	573,206
Truck maintenance garage	30,998
Total	604,204
Processing equipment:[2]	
4 70-case per hour egg processing machines[3]	371,800
2 tow motors	6,600
1 high lift	9,900
Boiler	1,100
Equipment plumbing and wiring	7,700
Miscellaneous	3,300
Total	400,400
Plant equipment:[2]	
Garage equipment	4,400
Fuel tanks	4,400
Heating and air conditioning	64,163
Refrigeration	29,480
Electric service and substation	19,800
5 175-kW standby generators	87,120
Miscellaneous	605
Total	209,968
Office equipment	3,300
Sewage disposal system	33,000
Grand total	1,250,872

[1] Based on early 1974 costs.
[2] Includes installation cost where applicable.
[3] Includes orienters, vacuum loaders, and egg washers, but excludes plastic flat washers.

Appendix table 16—Estimated centralized complex egg processing costs[1]

Cost item	Egg processing costs	
	Annual	Per dozen[2]
	Dollars	
Fixed:		
Depreciation:		
Buildings[3]	30,210	0.00143
Processing equipment[4]	50,050	.00237
Plant equipment[5]	12,546	.00059
Office equipment[6]	495	.00002
Sewage disposal system[7]	3,300	.00016
Interest on investment:		
Buildings and equipment[8]	48,715	.00231
Sewage disposal system[9]	1,320	.00006
Land and improvements[10]	3,254	.00015
Egg inventory[11]	4,274	.00020
Supplies inventory[12]	6,177	.00029
Taxes[13]	5,166	.00024
Insurance[14]	12,179	.00058
Total	177,686	.00841
Variable:		
Packaging materials[15]	771,070	.03651
Salaries and wages[16]	271,847	.01287
Employee benefits[17]	33,709	.00160
Maintenance and repairs[18]	43,781	.00207
Utilities[19]	31,679	.00150
Plant supplies[20]	19,007	.00090
Inspection and grading[21]	22,782	.00108
Total	1,193,875	.05653
Grand total	1,371,561	.06494

[1] Based on early 1974 costs.
[2] Based on 21,119,422 dozen processed.
[3] Buildings cost of $604,204 depreciated over 20 years.
[4] Processing equipment cost of $400,400 depreciated over 8 years.
[5] Plant equipment costs of $122,848 depreciated over 15 years and $87,120 over 20 years.
[6] Office equipment costs of $1,650 depreciated over 10 years and $1,650 over 5 years.
[7] Sewage disposal system cost of $33,000 depreciated over 10 years.
[8] Computed at 8 percent per year on the average undepreciated value of buildings and equipment, or half the original cost ($1,217,872 ÷ 2).
[9] Computed at 8 percent per year on the average undepreciated value of the sewage disposal system, or half the original cost ($33,000 ÷ 2).
[10] Computed at 8 percent per year on $40,672, a prorated share of the complex investment of $496,000 in 180 acres of land and improvements.
[11] Computed at 8 percent per year on the assumed average inventory of 3,857 cases of graded eggs valued at cost.
[12] Computed at 8 percent per year on assumed average inventories of 5 weeks' supply of packaging materials valued at $73,931 and 9 weeks' supply of plant supplies valued at $3,281.
[13] Estimated at 0.4 percent of $1,291,544 investment in buildings, equipment, sewage disposal system, and land and improvements.
[14] Estimated at 1 percent of $1,217,872 investment in buildings and equipment.
[15] Estimated at an average of $0.03651 a dozen, or $0.04240 a dozen for the 70 percent of eggs sold cartoned and $0.02276 a dozen for the 30 percent of eggs sold loose in cases.
[16] See app. table 17.
[17] Estimated at 12.5 percent of salaries and wages.
[18] Estimated at 3.5 percent of $1,250,872 investment in buildings, equipment, and sewage disposal system.
[19] Estimated at $0.0015 a dozen eggs processed.
[20] Estimated at $0.0009 a dozen eggs processed.
[21] Based on 1 full-time inspector for weekdays plus overtime for 1 inspector on weekends.

Appendix table 17—Employee requirements and costs for a centralized complex egg processing plant[1]

Position	Number of employees[2]	Length of work week	Hourly wage rate[3]	Annual cost
	Number	*Hours*	*Dollars*	
Plant manager	1			16,000
Weekday crew:				
Foreman	1			10,500
Candler	8	40	2.50	41,600
Packer	8	40	2.50	41,600
Machine operator	4	40	2.50	20,800
Case setup	1	40	2.50	5,200
Maintenance	1	48	5.00	13,520
Carton supply	1	46	3.10	7,899
Materials handler	2	45	3.00	14,820
Dock man	3	50	3.50	30,030
Cleanup	2	40	2.50	10,400
Weekend crew:				
Foreman	1	16	3.75	3,120
Candler	8	16	2.50	16,640
Packer	8	16	2.50	16,640
Machine operator	4	16	2.50	8,320
Case setup	1	16	2.50	2,080
Carton supply	1	18	3.10	2,902
Materials handler	2	18	3.00	5,616
Cleanup	2	16	2.50	4,160
Total	59	–	--	271,847

[1] Based on early 1974 costs.
[2] Based on operating 4 machines 1 shift a day, 7 days a week. Weekend crew is made up of part-time employees.
[3] Full-time employees on weekday crew paid time and one-half for work in excess of 40 hours a week.
- - = not applicable.

Appendix table 18—Estimated administrative overhead costs for a centralized complex[1]

Cost item	Administrative overhead costs	
	Annual	Per dozen[2]
	Dollars	
General expense[3]	168,955	0.00800
Assistant production manager[4]	14,063	.00067
Pickup truck expense[5]	2,315	.00011
Total	185,333	.00878

[1] Based on early 1974 costs.
[2] Based on 21,119,422 dozen produced and processed.
[3] Computed at $0.008 per dozen eggs produced. Includes expense for a production manager.
[4] Based on a salary of $12,500 plus 12.5 percent employee benefits.
[5] Includes depreciation over 3 years, interest on investment at 8 percent a year, insurance, license, maintenance and repairs, tires and tire repair, and fuel, oil, and lubrication for a pickup truck driven an estimated total of 12,000 miles a year.

Appendix table 19—Estimated total cost of producing and processing eggs in a centralized complex[1]

Complex function	Total annual cost	Cost per dozen eggs produced[2]	Cost per dozen eggs marketed[3]
		Dollars	
Feed processing	[4] 223,976	[5]	[5]
Feed distribution	[4] 28,692	[5]	[5]
Pullet growing	[4] 1,776,643	[5]	[5]
Egg production	8,146,748	0.38575	0.39362
Egg processing	1,371,561	.06494	.06627
Administrative overhead	185,333	.00878	.00895
Total	[6] 9,703,642	.45947	.46884

[1] Based on early 1974 costs.
[2] Based on 21,119,422 dozen eggs produced annually.
[3] Based on 20,697,034 dozen eggs produced annually.
[4] Included in total cost for egg production function.
[5] Not applicable.
[6] Does not include costs shown for feed processing, feed distribution, and pullet growing because they are included in egg production costs.

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